

IN THE CLAIMS:

1. (Currently Amended) A method for producing ~~an~~ a combined adaptive directional signal, ~~including~~ comprising the step of constructing the combined adaptive directional signal from a weighted sum of a first signal weight of a first signal having an omni-directional polar pattern and a second signal weight of a second signal having a bi-directional polar pattern, wherein the first and second signal weights are calculated to give the combined signal a constant gain in a predetermined direction and to ~~minimise~~ minimize the power of the combined signal.

2. (Original) A method according to claim 1 wherein the weights are calculated in a non-iterative manner.

3. (Currently Amended) A method according to claim 1 ~~or claim 2~~, wherein the constant gain is provided by imposing a constraint that the first signal weight and the second signal weight add to a predetermined value.

4. (Currently Amended) A method according to claim 2 ~~or claim 3~~ wherein the signal weights are calculated by solving the following equation:

$$a = \frac{\sum y^2 - \sum xy}{\sum x^2 - 2\sum xy + \sum y^2}$$

Where:

a = weight for the first signal

$(1-a)$ = weight for the second signal

x = first signal sample

y = second signal sample.

5. (Currently Amended) A method according to ~~any preceding claim~~ 1, wherein said signal weights are calculated for a series of frames, each frame having a predetermined length consisting N first signal samples and N second signal samples.

6. (Original) A method according to claim 5 wherein N=64.

7. (Currently Amended) A method according to claim 5 ~~or claim 6~~, further including the ~~step of~~ filtering or smoothing the series of weights to minimise frame-to-frame variation in the calculated weights.

8. (Currently Amended) A method according to ~~any one of claim[s] 1 [to 4]~~, wherein the first and second signals are sampled, the signal weights being calculated for successive sets of said first and second signals samples.

9. (Currently Amended) A method according to ~~claim 8 insofar as dependent on~~ claim 4, wherein the first and second signals are sampled, the signal weights being calculated for successive sets of said first and second signals samples, and the signal weights are calculated continuously by calculating x^2 , y^2 and xy for each sample and adding them to an appropriate running sum.

10. (Original) A method according to claim 9 wherein a leaky integrator is used to perform the running sum in order to address issues of numerical overflow.

11. (Currently Amended) A method in accordance with ~~any preceding claim 1~~, whereby said signal weights are calculated so as to construct an omni-directional combined signal when ~~the a~~ total power in said first signal is below a certain value.

12. (Currently Amended) [The] A method [of] ~~according to claim 11 insofar as dependent on~~ claim 4, whereby said signal weights are calculated so as to construct an omni-directional combined signal when a total power in said first signal is below a certain value and value α defaults to a value of 1.0 in the event that Σx^2 is less than a prescribed minimum value.

13. (Currently Amended) A method according to ~~any of claim[s] 1 to 12~~, wherein the first and second signals are derived from signals produced by two spaced omni-directional microphones, a front and a rear microphone, and said predetermined direction is the forward direction along the microphone axis.

14. (Original) A method according to claim 13, wherein the second signal is provided by the difference between signals produced by the front and rear microphones, without the use of a delay element.

15. (Currently Amended) A method according to claim 14, further ~~including~~ comprising the ~~step of~~ processing the second signal by means of an integrator element or an integrator-like filter before constructing the combined signal, thereby compensating for the attenuation of low frequencies and phase shifts introduced in the subtraction of the two omni-directional signals.

16. (Currently Amended) A method according to claim 14, further ~~including~~ comprising the ~~step of~~ amplifying the signals produced by the front and/or the rear microphone before the ~~step of~~ constructing the bi-directional signal, to ensure an equivalent gain between the microphones.

17. (Currently Amended) A method according to ~~any preceding claim 1~~, wherein said first and second signals are frequency domain samples.

18. (Currently Amended) A method according to claim 17, further ~~including~~ comprising the ~~step of~~ calculating and applying the weights to several independent subsets of frequency domain samples, to give different directional responses at different frequencies and/or to allow selective suppression of different frequencies.

19. (Currently Amended) A method according to ~~any preceding claim 1~~, ~~including~~ comprising the ~~step of~~ applying a frequency weighting function to said first and second signal before calculating said signal weights.

20. (Currently Amended) An apparatus for producing ~~an~~ a combined adaptive directional signal, the apparatus ~~including~~ comprising: ~~means~~ apparatus including a ~~an~~ analog-to-digital converter for producing a first signal having an omni-directional polar pattern and a second signal having a bi-directional polar pattern; and ~~means~~ apparatus including a summation device for constructing the adaptive directional signal from a weighted sum of a first signal weight of the first signal and a second signal weight of the second signal ~~signal~~, wherein the first and second signal weights are calculated to give the combined signal a constant gain in a predetermined direction and to ~~minimise the~~ minimize power of the combined signal.

21. (Original) An apparatus according to claim 20, including means to provide said constant gain by imposing a constraint that the first signal weight and the second signal weight add to a predetermined value.

22. (Currently Amended) An apparatus according to claim 20 ~~or 21~~, including means for calculating the weights by solving the following equation:

$$a = \frac{\sum y^2 - \sum xy}{\sum x^2 - 2\sum xy + \sum y^2}$$

Where:

a = weight for the first signal

$(1-a)$ = weight for the second signal

x = first signal sample

y = second signal sample.

23. (Currently Amended) An apparatus according to ~~any one of claim[s] 20 to 22~~, including means for calculating said signal weights for a series of frames, each frame having a predetermined length consisting of N first signal samples and N second signal samples.

24. (Currently Amended) An apparatus according to ~~any one of claim[s] 20 to 23~~, including a filter for filtering or smoothing the series of weights to ~~minimise~~ minimize frame-to-frame variation in the calculated weights.

25. (Currently Amended) An apparatus according to ~~any one of claim[s] 20 to 24~~, including means for calculating said weights continuously for samples of said first and second signals.

26. (Currently Amended) An apparatus according to ~~any one of claim[s] 20 to 25~~, including a leaky integrator to perform a running sum on said first and second signal samples in order to address issues of numerical overflow system memory.

27. (Currently Amended) An apparatus according to ~~any one of claim[s] 20 to 26~~, including means for calculating said signal weights so as to construct an omni-directional combined signal when ~~the~~ a total power in said first signal is below a certain value.

28. (Currently Amended) An apparatus according to ~~any one of claim[s] 20 to 27~~, including two spaced omni- directional microphones, a front and a rear microphone, signals from which are used for deriving said first and second signals, and said predetermined direction is the forward direction along the microphone axis.

29. (Original) An apparatus according to claim 28, including means for providing said second signal from the difference between signals produced by the front and rear microphones, without the use of a delay element.

30. (Currently Amended) An apparatus according to claim 28 ~~or claim 29~~, including an integrator element or an integrator-like filter for processing the second signal before constructing the combined signal, thereby compensating for ~~the~~ attenuation of low frequencies and phase shifts introduced in the provision of the second signal.

31. (Currently Amended) An apparatus according to ~~any one of claim[s] 28 to 30~~, including a means for amplifying the signals produced by the front and/or the rear microphone before the step of constructing the bi-directional signal, to ensure an equivalent gain between the microphones.

32. (New) A computer program stored in a computer-readable storage medium, said computer program, when executed by a computer, performing the step of: constructing the combined adaptive directional signal from a weighted sum of a first signal weight of a first signal having an omni-directional polar pattern and a second signal weight of a second signal having a bi-directional polar pattern, wherein the first and second signal weights are calculated to give the combined signal a constant gain in a predetermined direction and to minimize power of the combined signal.--